



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/631,951	07/30/2003	Viatcheslav V. Osipov	200308747-1	1787

7590 09/09/2004
HEWLETT-PACKARD COMPANY
Intellectual Property Administration
P.O. Box 272400
Fort Collins, CO 80527-2400

EXAMINER

RICHARDS, N DREW

ART UNIT	PAPER NUMBER
----------	--------------

2815

DATE MAILED: 09/09/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/631,951

Applicant(s)

OSIPOV ET AL.

Examiner

N. Drew Richards

Art Unit

2815

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 30 July 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-37 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 32-37 is/are allowed.
- 6) ☒ Claim(s) 1,2,9-15,20,28 and 29 is/are rejected.
- 7) ☒ Claim(s) 3-8,16-19,21-27,30 and 31 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 30 July 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>7/30/03</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Specification

1. The disclosure is objected to because of the following informalities: Paragraph 1 of the specification includes reference to various co-pending applications. Serial numbers are not provided for two of these applications. Applicant is required to amend the specification to provide serial numbers for these applications.

Appropriate correction is required.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claim 20 recites the limitation "the semiconductor region" in lines 3-4. There is insufficient antecedent basis for this limitation in the claim.

4. Claim 20 recites the limitation "the ferromagnetic-semiconductor junctions" in lines 4-5. There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Art Unit: 2815

6. Claims 1, 2, 9, 10, 13, 28 and 29 are rejected under 35 U.S.C. 102(b) as being anticipated by Sarma ("Spintronics", American Scientist, Volume 89, Pp. 516-523, November-December 2001).

Sarma disclose in figure 3 and the accompanying text on page 518 a device comprising:

- a first magnetic region (emitter) having a first magnetization;
- a control region (channel) forming a first interface with the first magnetic region;
- a second magnetic region (collector) forming a second interface with the control region, the second magnetic region having a second magnetization that is substantially collinear with the first magnetization (P. 518, col.3 lines 6-7 teach the second magnetic region having the same electrode magnetization); and
- a wire (gate) positioned relative to the control region (channel) so that a current through the wire creates in the control region a magnetic field that rotates spins of electrons injected through the control region between the first magnetic region and the second magnetic region.

The description directly below figure 3 discloses that when the gate is on the field produced causes magnetic interaction that causes the spins (of the electrons) to precess (rotate).

With regard to claim 2, the first magnetization and the second magnetization are substantially parallel as they are disclosed as being the same.

With regard to claim 9, the control region is inherently formed such that an electron spin relaxation time of the control region is longer than a transit time of the

Art Unit: 2815

electrons traversing the control region. If this was not the case the device would not function as designed as the relaxed electrons could change to any spin state and thus the gate would not control the flow of electrons into the collector.

With regard to claim 10, the control region is a semiconductor material (specifically labeled as InGaAs).

With regard to claim 13, the first magnetic region comprises a ferromagnetic material (as labeled).

With regard to claim 28, the device further comprises a substrate, wherein the first magnetic region, the second magnetic region, and the control region are a surface of the substrate, with the control region being between the first magnetic region and the second magnetic region (as shown in figure 3 the device is formed on a top surface of an InGaAs substrate).

With regard to claim 29, the wire comprises a first section overlying the control region.

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. Claims 11, 12, 14 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sarma as applied to claims 1, 2, 9, 10, 13, 28 and 29 above.

Art Unit: 2815

With regard to claim 11, Sarma does not explicitly state the control region being selected from the group consisting of Si, Ge, GaAs, GaInAs, ZnSe, ZnCdSe, and alloys or combinations of these materials. However, it is considered obvious to one of ordinary skill in the art at the time of the invention to form the control region of a GaAs or GaInAs based material. The reason for doing so is the high carrier mobility of these materials.

With regard to claim 12, though not explicitly stated it is nonetheless implicitly obvious to form the semiconductor material with n-type doping to allow a higher concentration of electrons to be available to add to the current.

With regards to claims 14 and 15, these claimed dimensions are obvious to one of ordinary skill in the art. Though Sarma does not explicitly state any dimensions for the device of figure 3, these claimed dimensions are considered obvious. It would have been obvious to one of ordinary skill in the art to form the wire with a cross-sectional dimension less than 100 nm and the control region with a thickness less than 100 nm to allow the device to be formed smaller so that a higher density of devices may be formed on the substrate.

Allowable Subject Matter

9. Claims 32-37 are allowed.

Art Unit: 2815

10. Claims 3-8, 16-19, 21-27, 30 and 31 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

11. The following is a statement of reasons for the indication of allowable subject matter: Prior art of record fails to teach, disclose, or suggest, either alone or in combination:

- the first magnetization and second magnetization anti-parallel to each other as recited in claim 3;
- a third and fourth terminal connected to ends of the wire as recited in claim 4, Sarma teach a single terminal connected to the gate to apply a voltage thereto, but no suggestion was found to connected another terminal to the end of the gate;
- the first magnetic region overlying the wire, the control region over the first magnetic region, and the second magnetic region over the control region as recited in claim 16;
- a first and second anti-ferromagnetic layer adjacent the first and second magnetic regions, respectively, as recited in claim 19;
- the control region overlying the first magnetic region and the second magnetic region overlying the control region as recited in claim 21;
- a conductive section that underlies the control region and forms part of the wire as recited in claim 30;

Art Unit: 2815

- generating an output signal having a frequency differing from that of an input signal as recited in claim 32.

Conclusion

12. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Parkin (U.S. Patent No. 5966012), Johnson (U.S. Patent No. 5565695), Jonker (U.S. Patent No. 5874749), Giebeler et al. (US Pub No. 2003/0042562 A1), Flatteet et al. (U.S. Patent No. 6624490 B2), Sato et al. (U.S. Pub No. 2002/0043974 A1).

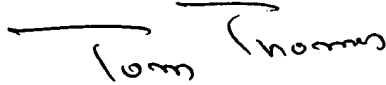
Any inquiry concerning this communication or earlier communications from the examiner should be directed to N. Drew Richards whose telephone number is (571) 272-1736. The examiner can normally be reached on Monday-Friday 9:00-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Thomas can be reached on (571) 272-1664. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Art Unit: 2815

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

NDR


TOM THOMAS
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800